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(54) CHANNEL ALLOCATION FOR A COMMUNICATIONS SYSTEM

KANALZUWEISUNG FÜR EIN KOMMUNIKATIONSSYSTEM

ALLOCATION DE CANAL DANS UN SYSTEME DE COMMUNICATIONS

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WO-A-95/02307 **WO-A-97/01254**
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Description**FIELD OF THE INVENTION**

[0001] The present invention relates to a method at a cellular radio communications system to reduce the probability of congestion of multislots mobiles in said systems.

PRIOR ART

[0002] In the future, the GSM-system will offer high speed data services. One of the data services is HSCSD (High Speed Circuit Switched Data). This service in its turn includes two services "fixed service" and "flexible service". At "fixed service" the mobile is allocated a fixed number of time slots which shall be allocated in a fixed way during the whole call, whereas at "flexible service" the number of allocated time slots can vary during the course of the call. The mobile stations of today with their simplex filters can perform only one thing at a time, i.e. either transmit or receive. Therefore it is of great importance to allocate consecutive time slots for multislots mobiles. This makes great demands upon the mobile system to make it possible to manage both data services and voice services at the same time. Not least there will be demands on the algorithm of the channel allocation to, in a more intelligent way, allocate the free time slots to increase the channel utilization and the data speed.

[0003] The intention is that in the future the mobile will, at its arrival, request a service and with this a number of time slots. If the service is "fixed service" and the free capacity is lower than the requested, the mobile will be blocked. If, on the other hand, the service is "flexible service", the free capacity is allocated. The demand for consecutive time slots for multislots mobiles and the use of many time slots for a mobile results in that:

- the probability of congestion for multislots mobiles which request "fixed service" will be considerably higher than for mobiles which request other services (for instance voice services).
- that the mean data rate for mobiles which have requested "flexible service" will be low.

[0004] From the operator's point of view it is desirable to have the same probability of congestion for all mobile users, irrespective of service. This will, among other things, facilitate the network planning and restrict the use of the priority concept. Another object desired is to get such a high data rate as possible.

[0005] The aim of the present invention consequently is to reduce the probability of congestion of multislots mobiles and reduce this probability of congestion to a level which corresponds to the level for one-slot mobiles.

[0006] WO-A-9701254 discloses a system for intracell handover. The handover is used to reduce interference. However, in WO-A-9701254 it is neither disclosed

nor suggested to provide consecutive time slots.

SUMMARY OF THE INVENTION

5 **[0007]** The above mentioned aim is achieved by a method according to claim 1.

[0008] Further characteristics of the present invention are given in the subclaims.

10 DETAILED DESCRIPTION OF AN EMBODIMENT OF THE INVENTION

[0009] Intracell handover means that a call going on is switched from a physical channel to another physical channel in the same cell, i.e. changes from one time slot to another time slot in the same cell. Intracell handover is a known technology to reduce the interference, i.e. if a physical channel gives rise to interference, there will be a change to a channel with less interference.

15 **[0010]** Intracell handover consequently means that the system moves an existing call from one time slot to another time slot which is in the same cell. The mobile at intracell handover consequently changes the time slot and not the cell. A cell is a coverage area for a base station. This base station can have one or more TRXes. A TRX consists of one frequency in uplink and one frequency in downlink. Each frequency in GSM is divided into 8 time slots. Consecutive time slots means that time slots are following each other in time.

20 **[0011]** To make multislots mobiles getting consecutive time slots, one or more mobiles have to change channel (time slot). What one is doing is a change of occupied channels (time slots) in order to arrange that the multislots mobiles which need consecutive time slots will have access to these.

25 **[0012]** Multislots mobiles without duplex filters require consecutive time slots because these mobiles only can do one thing at a time, i.e. either transmit, measure or receive information. Consecutive time slots make it possible to increase the function time for transmitting and receiving data information without these functions interfering with each other in time. If, on the other hand, duplex filters are used, the mobile can receive and transmit data information at the same time.

30 **[0013]** When intracell handover in the present invention creates consecutive time slots, extra consecutive time slots are made accessible to mobiles which request "flexible service", which means that these mobiles can utilize said time slots to transfer data. Consequently the data speed will increase for mobiles which have requested "flexible service" since more time slots can be utilized.

35 **[0014]** In this embodiment, accordingly, intracell handover is used to satisfy the demands for the multislots mobiles for consecutive time slots.

[0015] This will result in that the probability of congestion for mobiles which request "fixed service" will be considerably reduced and will approach the probability of

congestion for one-slot mobiles. Another advantage of intracell handover is that the mean data rate for mobiles which have requested "flexible service" will increase.

[0016] Intracell handover, however, will not be enough to achieve an optimal system. The present invention completes the use of intracell handover in order to optimize the system. The present invention consequently includes two completing steps in order to further reduce the probability of congestion and increase the data speed.

1) At "fixed service" it is not sufficient with intracell handover to eliminate the difference between probability of congestion for multislots- and one-slot mobiles. Therefore an extra measure must be taken which implies that if the system contains multislots mobiles with "fixed service" and x number of requested time slots, all mobiles which are coming to the system and finding maximally $x-1$ time slots free, shall be blocked. This procedure can be made on cell basis, which results in that the problem of truncating is abolished.

2) At "flexible service" it is not sufficient that the mobile requests a number of time slots, but it must always request maximal number of allowed time slots.

[0017] The invention is primarily intended to be utilized in connection with the use of future data services in GSM, namely HSCSD (High Speed Circuit Switched Data) in the GSM-system, or similar systems where multichannels are used by a user.

[0018] The above mentioned is only to be regarded as a preferred embodiment of the invention, and the extent of protection of the invention is only defined by what is indicated in the enclosed patent claims.

Claims

1. Method at a cellular radio communications system to reduce the probability of congestion for multislots mobiles in said system, where intracell handover is utilized to reduce said probability of congestion, characterized in that, to make multislots mobiles getting consecutive time slots, one or more mobiles are handed over to other time slots in the same cell in order to re-arrange the occupied time slots so that the multislots mobiles which need consecutive time slots can have access to them, whereby said intracell handover is utilized to satisfy the demands for consecutive time slots for multislots mobiles which request the data service "Fixed Service", by which the probability of congestion for said multislots mobiles will be reduced to a level which will approach the probability of congestion for one-slot mobiles, and whereby the data speed for mobiles which have requested the service "Flexible Service"

will increase.

2. Method according to patent claim 1, characterized in that, in addition to intracell handover, it includes the steps that:

- 1) if said system contains multislots mobiles which have requested the service "Fixed Service" and x time slots, all mobiles which are coming to said system and finding maximally $x-1$ free time slots, are blocked;
- 2) if the service "Flexible Service" has been requested by a mobile, it is not sufficient that the mobile requests a number of time slots, but the mobile always has to request maximal number of allowed time slots.

3. Method according to patent claim 2, characterized in that said services are included in HSCSD.

4. Method according to patent claim 3, characterized in that said radio communications system consists of GSM.

Patentansprüche

1. Verfahren bei einem zellulären Telekommunikationssystem zur Verringerung der Überlastungswahrscheinlichkeit für Multislot-Mobiltelefone in dem System, in welchem eine intrazelluläre Übertragung verwendet wird, um die Überlastungswahrscheinlichkeit zu verringern, dadurch gekennzeichnet, dass Multislot-Mobiltelefone aufeinanderfolgende Zeitkanäle erhalten, ein oder mehrere Mobiltelefone von anderen Zeitkanälen in der selben Zelle übernommen werden, um die besetzten Zeitkanäle neu zu ordnen, damit die Multislot-Mobiltelefone, die aufeinanderfolgenden Zeitkanäle benötigen, Zugang zu diesen haben, wobei die intrazelluläre Übernahme verwendet wird, um die Forderungen nach aufeinanderfolgenden Zeitkanälen für Multislot-Mobiltelefone zu erfüllen, die den Datendienst "Feststehender Dienst" anfordern, wodurch die Überlastungswahrscheinlichkeit für die Multislot-Mobiltelefone auf ein Niveau gesenkt wird, dass sich der Überlastungswahrscheinlichkeit für "One-Slot-Mobiltelefone" annähert, und wodurch die Datengeschwindigkeit für diejenigen Mobiltelefone steigt, welche den Dienst "Flexibler Dienst" angefordert haben.

2. Verfahren nach Anspruch 1, dadurch gekennzeichnet, dass zusätzlich zu der intrazellulären Übernahme die Schritte enthalten sind, dass

- 1) wenn das System Multislot-Mobiltelefone enthält, die den Dienst "Feststehender Dienst" angefordert haben und x Zeitkanäle haben, alle Mobiltelefone, die in das System kommen und maximal $x-1$ freie Zeitkanäle finden, blockiert werden;
- 2) wenn der Dienst "Flexibler Dienst" von einem Mobiltelefon angefordert worden ist, es nicht ausreichend ist, dass das Mobiltelefon eine Anzahl von Zeitkanälen anfordert, sondern das Mobiltelefon immer eine maximale Anzahl von zulässigen Zeitkanälen anfordern muss.
3. Verfahren nach Anspruch 2,
dadurch gekennzeichnet, dass die Dienste in HSC-
SDenthaltensind.
4. Verfahren nach Anspruch 3,
dadurch gekennzeichnet, dass das Telekommunikationssystem aus GSM besteht.
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système et trouvent au maximum $x-1$ intervalles de temps libres sont bloqués ;
(2) si le service « Service Flexible » a été demandé par un mobile, il ne suffit pas que le mobile demande un nombre d'intervalles de temps, mais le mobile doit toujours demander un nombre maximal d'intervalles de temps alloués.

3. Procédé selon la revendication 2, **caractérisé en ce que les dits services sont inclus dans HSCSD.**
4. Procédé selon la revendication 3, **caractérisé en ce que le dit système de radiocommunication est un système GSM.**

Revendications

1. Procédé, dans un système de radiocommunication cellulaire, de réduction de la probabilité de congestion pour des mobiles à intervalles de temps multiples dans le dit système, dans lequel on utilise un transfert intracellulaire pour réduire la dite probabilité de congestion,
caractérisé en ce que, pour que les mobiles à intervalles de temps multiples obtiennent des intervalles de temps consécutifs, un ou plusieurs mobiles sont transférés à d'autres intervalles de temps dans la même cellule afin de réarranger les intervalles de temps occupés de sorte que les mobiles à intervalles de temps multiples qui nécessitent des intervalles de temps consécutifs puissent y accéder, le dit transfert intracellulaire étant ainsi utilisé pour satisfaire aux demandes d'intervalles de temps consécutifs pour des mobiles à intervalles de temps multiples qui demandent le service de données « Service Fixe », de sorte que la probabilité de congestion pour les dits mobiles à intervalles de temps multiples sera réduite à un niveau proche de la probabilité de congestion pour des mobiles à intervalle de temps unique, et de sorte que la vitesse de données pour les mobiles qui ont demandé le service « Service Flexible » augmente.
2. Procédé selon la revendication 1, **caractérisé en ce que**, en plus du transfert intracellulaire, il comprend les étapes suivantes :
- (1) si le dit système contient des mobiles à intervalles de temps multiples qui ont demandé le service « Service Fixe » et x intervalles de temps, tous les mobiles qui viennent dans le dit
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